XXV. *On the Chronology of the Hindoos.*

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Read June 24, 1790.

IT is my deſign to treat, in the following Paper, of the CHRONOLOGICAL ERAS in uſe among the people of Aſia, called *Hindoos*, who profeſs in general the religion of *Brahma*, and are conſidered as the indigenous inhabitants of India. The elaborate reſearches into their recondite writings, made by thoſe gentlemen who have applied themſelves to the ſtudy of *Sanſkreet* literature, afford us ground to expect conſiderable diſcoveries in regard to the ſcientific attainments of this ancient and celebrated people. Their aſtronomy in particular has attracted the attention of the learned in Europe, who ſee in it the internal evidence of very remote antiquity, and are diſpoſed to allow its pretenſions to originality; many ſtrong and unequivocal traces indicating that the Greek ſchool at leaſt derived more than the elements of their knowledge, by no very circuitous channel, from this oriental ſource.

Unfortunately for the gratification of rational curioſity, hiſtory ſeems to have been, of all branches of ſtudy, that which the Hindoos cultivated with the leaſt care, and we regret to find the periods marked by the revolutions of the heavenly bodies, of which other nations have availed themſelves to aſcertain and record the important events in human

affairs,

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affairs, by them unprofitably applied to the dreams of their mythology. The unremitted labour of ages has been devoted to perfecting the calculation of the lunar motions, in which their correctneſs is ſurpaſſed only by the European improvements of very modern times; but, by a ſtrange perverſion, the accuracy thence acquired in their prediction of eclipſes, appears to have no other object than that of adminiſtering to an idle ſuperſtition, which it ought to deſtroy.

Although the *fabulous* exceedingly prevails in all the ancient documents hitherto introduced to our knowledge, and in none more conſpicuouſly than thoſe which contain the genealogies and reigns of their early kings (*a*) *, yet we are not haſtily to conclude, that this people are deſtitute of records of true hiſtory. The portion of their literary ſtores which we have had opportunity to examine is comparatively ſmall. Perſeverance may diſcover annals, more or leſs ancient, whoſe preſent obſcurity is perhaps occaſioned by that very circumſtance which conſtitutes their real value — the want of the *miraculous.* Some authentic monuments have already been elucidated by the learned ſkill of a gentleman, now a Member of the Royal Society. Facts will accumulate by degrees, and acquire authority by mutually bearing on each other; and the Hindoos, like many other nations of the world, may hereafter be indebted to ſtrangers, more enlightened by philoſophy than themſelves, for a rational hiſtory of their own country.

In different parts of India, and even in one and the ſame part, we obſerve various chronological eras referred to, as well in their aſtronomical treatiſes, as in their political and private writings. Theſe being productive of confuſion, if not clearly underſtood and diſcriminated, I ſhall endeavour to exhibit ſuch a comparative ſtatement of their reſpective commencements and coincidences as may tend to remove this impediment to the progreſs of hiſtorical knowledge. I am not aware that any attempt has hitherto been made in Europe, to bring them into one point of view; and as an opportunity is hereby given of correcting ſome errors that we have been led into by the ſanction of reſpectable names, I am induced to think, that what I have undertaken will not be conſidered as ſuperfluous.

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* See the Notes at the end of the Paper.

My preſent purpoſe does not lead me to attempt a diſcuſſion of what may be termed the *factitious* periods of Hindoo computation, or to explain the nature and duration of the four ages, or *Yoogs*, which this ſpeculative people, in the wanton exerciſe of numerical power, have portioned out from the boundleſs region of time. The three former of theſe diviſions, even though the progreſſive numbers aſſigned to them ſhould be admitted as the reſult of aſtronomical combination, can be preſumed to have but little reference to practical chronology, which ſeems to trace its origin no higher than the commencement of the fourth, or preſent age, denominated the *Kalee Yoog*. This conſtitutes the principal era to which I would draw attention, and comprehends within it theſe that follow; the era of *Bikramajit*, the era of *Salabân*, the Bengal era (not ſtrictly Hindoo), and the cycle of ſixty years.

Before I proceed to a compariſon of their ſeveral dates, it will be proper to define the nature of the year and its conſtituent parts, according to which theſe eras are computed by the *Brahmans*, who are the depoſitaries of ſcience as well as of religion. Their aſtronomical year is the meaſure of that portion of time which is employed in a revolution of the ſun, from the moment of his departure from a certain ſtar in their zodiac, as ſeen from the earth, till his return to the ſame. It is therefore ſolar and ſydereal, and contains, by their calculation,

365 d.

365 d. 6 h. 12′ 30″; and as they ſuppoſe the annual movement of the ſtars in longitude, or the preceſſion of the equinoxes, to be 54 ſeconds of a degree, or 21′ 36″ of time (admitting, with them, the ſun to move at the rate of a degree each day), their tropical year will be 365 d. 5 h. 50′ 54″ (*b*): but as the ſun really moves over 54″ in 21′ 55″, its length is ſtrictly 365 d. 5 h. 50′ 35″, or 1′ 52″ greater than the tropical year as determined by MAYER at 365 d. 5 h. 48′ 43″. The true preceſſion being 50″,3, which ſpace the ſun deſcribes in 20′ 25″, the true ſydereal year is 365 d. 6 h. 9′ 8″, and conſequently the Hindoo year exceeds it by 3′ 22″, or one day in 430 years. If the opinion of aſtronomers is well founded, that a ſenſible diminution in the length of the year, as well as in the angle of obliquity of the ecliptic, has gradually taken place in the lapſe of many ages, it will follow, that this error may not have exiſted, or been ſo great, at the period of adjuſting the Hindoo tables: and when we conſider that there appears no ground to believe their apparatus for obſerving was ever much ſuperior to what it is diſcovered amongſt the Brahmans of this day (*c*), we are led to wonder at the preciſion attained to in this determination, and which, in the calculation of the moon's apogee, is ſtill more remarkable. The defect of art can have been compenſated only by the remote antiquity in which the ſeries of their obſervations originated, affording an opportunity of correcting the inaccuracy of particular meaſurements by a mean of large numbers and diſtant intervals.

They divide the zodiac into twenty-eight lunar and into twelve ſolar conſtellations or ſigns (*d*), and their aſtronomical year commences with the ſun's arriving at the firſt point of their conſtellation of *Aries*. This diviſion of the zodiac, ſo far as the accuracy of their obſervations allows, is connected with the actual phænomena of the heavens, and advances with the apparent motion of the ſtars, from eaſt to weſt, leaving gradually behind it the equinoctial points, and is not, like our zodiac, an abſtract diviſion of ſpace, attached to thoſe points, and independent of the ſtarry ſyſtem. Calculating on their principles, the difference of the two zodiacs, or the accumulated amount of the annual preceſſion, ſince the coincidence ſuppoſed to be in the year of the Chriſtian era 499, is in the the preſent year 19° 21′ 54″.

The length of their months is determined by the time which the ſun employs in paſſing each ſign, and they are accordingly longer in the *apogee*, and ſhorter in the *perigee*; that which correſponds with the higher *apſis* being 31 d. 14 h. 39′, and that with the lower 29 d. 8 h. 21′ only. It does not appear, that the Hindoos are accuſtomed to enumerate, for civil purpoſes, the days of the ſolar month, but to date from the age of the moon that happens to fall within that month, or frequently from the ſimple phaſe of the moon (*e*).

Their feſtivals and faſts, like thoſe of the Jews and Chriſtians, being regulated, for the moſt part, by the lunar revolutions, they employ on this account, excluſively of the ſolar, aſtronomical reckoning, a lunar year (*f*). This they make to conſiſt ordinarily of twelve months, and each ſemi-lunation is diſtinguiſhed into fifteen equal portions, or lunar days, which are ſomewhat ſhorter than the natural day. In order to preſerve its general correſpondence with the ſolar year, "they reckon "twice that lunation during which the ſun does not enter upon "any new ſign" (*g*), or, in other words, which falls completely within a ſolar month; and the obvious reaſon for this mode of intercalating is, that as the lunar months take their denomination from the ſolar month in which the *change* happens, if two new moons fall within the ſame month, they naturally take the ſame name, and no irregularity is obſervable. This opportunity of encreaſing the number of lunar months, without embarraſſing the reckoning, preſents itſelf, on a medium of a few years, juſt as often as is requiſite to effect the compenſation. It cannot happen in all the ſolar months indifferently, their lengths being unequal, and ſome of them ſhorter than the ſynodical lunar month.

The commencement of the ſolar day is uſually eſtimated from ſunriſe, and the ſpace between that and the ſunriſe of the following day is divided into *ſixty* parts, the length of which muſt vary with the ſun's unequal courſe through the ecliptic; but for the purpoſes of calculation it is ſuppoſed to be aſcertained at the ſolſtices, and is equal to twenty-four of our minutes. The ſubdiviſions, in like manner, follow the ſexageſimal ſcale. There is alſo a mechanical diviſion of the day and night into *eight* parts, of which four are allowed to the interval from ſunriſe to ſunſet, and four to that from ſunſet to ſunriſe. The proportion of length of theſe parts reſpectively depends therefore upon the ſeaſon of the year and the latitude of the place, and the diviſion is conſequently inapplicable to general aſtronomy.

The days of the week are denominated from the ſeven planets, and their arrangement is the ſame with that adopted in the weſtern parts of the world, proceeding from the ſun and moon to Mars, Mercury, Jupiter, Venus, and Saturn (*h*). Friday, or the day of Venus, appears as the firſt of the week in their calculations, and probably becauſe the *Kalee Yoog* began on that day; but, in common, the week is conſidered by the Hindoos as beginning with Sunday.

Having thus briefly touched upon ſuch points of their aſtronomy as are immediately connected with the meaſurement of time, I proceed to the compariſon of their *eras*, which I ſhall firſt bring into one general view, and afterwards conſider ſeparately.

Table exhibiting the correſpondence of the ſeveral *Hindoo eras* with each other, and with the Julian period and Chriſtian era.

	Julian period.	*Kalee Yoog.*	Era of *Bikramajit.*	Chriſtian era.	Era of *Salabân*	Bengal era.	Cycle of 60 years.
Kalee Yoog, or grand era	1612	0					13
Era of *Bikramajit* .	4657	3045	0				58
Chriſtian era . .	4713	3101	56	0			54
Era of *Salabân* .	4791	3179	134	78	0		11
Preſent cycle of 60 years	6460	4848	1803	1747	1669	1154	1
Year 1790 of J. C. (from April) .	6503	4891	1846	1790	1712	1197	44

For better underſtanding the above table, it is neceſſary to remark, that when the Hindoos quote the year of an era, they do it by the number of the elapſed or complete year; whereas, the common European mode is to date by the number of the current or incomplete year; therefore what we ſhould term the firſt year of an era, is with them the year *zero*, and their year *one* that which follows; excepting in the cycle of ſixty, of which the year *one* immediately ſucceeds the laſt complete year of the former cycle. The difference in years between any two eras is expreſſed by the number appearing at the interſection of the horizontal and perpendicular lines, to which the names of ſuch eras are prefixed; or it may be found by ſubtracting the leſſer number from the greater, as they ſtand in any of the horizontal lines, under their reſpective names at the top of the perpendicular columns; thus, the years intervening between the era of *Salabân*, and that of the *Kalee Yoog*, are denoted by the number 3179, at the interſection of the two lines, or equally by deducting 1712 from 4891, in the loweſt horizontal line.

In a compariſon of the dates of the earlier Hindoo eras with the Chriſtian era, there occurs a difficulty which it is proper to conſider apart. This ariſes from an ambiguity in our manner of reckoning the years before Chriſt. It is moſt uſual to paſs immediately from the year *one after* to the year *one before* Chriſt, making the interval of time only one year; but ſome of the beſt chronologiſts paſs from the year *one after* to the year *zero*, and from thence to the year *one before*; by which means the interval between any number of years before and after Chriſt is equal to the ſum of thoſe numbers; and as this method is uſed in almoſt all aſtronomical tables, it may, without impropriety, be called the *aſtronomical*, and the other the *common* method. The following rules will facilitate the reduction of the ſeveral Hindoo years to thoſe of the Chriſtian era, and to the years before it.

To find the year of Chriſt correſponding with a given date of the		when the date is poſterior to our era,			
	Kalee Yoog,		ſubtr.	3101	from it.
	E. of *Bikramajit*,			56	
	E. of *Salabân*,		add	78	to it.
	Bengal era,			593	
	Preſent cycle, of 60 years,			1746	
	Enſuing cycle,			1806	

But when the date is prior to our era, ſubtract the

year of Kalee Yoog from 3102 for *common* method.
year of Kalee Yoog from 3101 for *aſtronomical* method.
year of Bikramajit from 57 for *common* method.
year of Bikramajit from 56 for *aſtronomical* method.

As the Hindoo year begins in our month of April (which will be particularly explained), we muſt obſerve, in reducing any Hindoo date to the Chriſtian era, that when it happens between the commencement of our year and theirs, the number of their year muſt be increaſed by one, and the ſubtraction or addition then made as above directed.

The *Kalee Yoog*, or principal chronological era, began in the year juſt ſpecified, when the ſun's mean place was in the firſt point of the conſtellation *Aries* of the Hindoo zodiac; which happened on the 18th of February, at ſunriſe (*i*), under their firſt meridian, called the meridian of *Lanka*. At that period, it is ſaid to be aſſerted by their aſtronomers, that the ſun, moon, and all the planets, were in conjunction, according to their mean places. The reality of this fact, but with conſiderable modification, has received a reſpectable ſanction from the writings of an ingenious and celebrated Member of the French Academy of Sciences, who concludes, that the actual obſervation of this rare phænomenon, by the Hindoos of that day, was the occaſion of its eſtabliſhment as an aſtronomical epoch (*k*). Although M. BAILLY has ſupported this opinion with his uſual powers of reaſoning, and although abundant circumſtances tend to prove their early ſkill in this ſcience, and ſome parts of the mathematics connected with it (*l*), yet we are conſtrained to queſtion the verity or poſſibility of the obſervation, and to conclude rather that the ſuppoſed conjunction was, at a later period, ſought for as an epoch, and calculated retroſpectively. That it was widely miſcalculated too, is ſufficiently evident from the computation which M. BAILLY himſelf has given of the longitudes of the planets at that time, when there was a difference of no leſs than 73° between the places of Mercury and Venus. But fifteen days after, when the ſun and moon were in oppoſition, and the planets far enough from the ſun to be viſible, he computes that all, excepting Venus, were comprehended within a ſpace of 17°; and on this he grounds his ſuppoſition of an actual obſervation.

Calculating from the rules laid down by the Brahmans (as given by M. LE GENTIL), it appears, that 4891 mean years of this era expired on Monday, 12th April, 1790, at 4½ h. and that the true place of the ſun came to the firſt of Aries, and conſequently that the 4892d year (or 4891 complete, as the Hindoos expreſs it) actually began on the 10th, at 1 h., or on Sunday, 11th April, in their civil way of reckoning (*m*). Thus we ſee that, during this long period of time, the Hindoo account has loſt upon the Julian 42 days, allowing for the change that took place in our ſtyle. The year of the former exceeding the latter by 12′ 30″, falls continually later and later on our old ſtyle year, at the rate of a day in about 115 years; and from this the commencement of any future year may be readily computed. The annual irregularity obſervable, which is independent of this almoſt imperceptible change, ariſes only from our mode of intercalating a day at the end of every fourth year, to compenſate the fractions that have accumulated during that time. The Hindoo aſtronomical year, admitting of no intercalation, cannot preſerve an annual correſpondence, but began at nearly the ſame time, with reſpect to our year, in 1786 as in 1790; in 1775 and 1787, ſix hours later; in 1781 and 1785, ſix hours ſooner; and in 1784 and 1788 (being leap years) eighteen hours ſooner than in 1787. The civil year begins at the ſunriſe immediately preceding the calculated commencement of the aſtronomical, when that happens during the day; but if in the night time, it begins at the ſunriſe following, and will conſiſt of 366 days ſo often as the exceſs of the aſtronomical year above 365 amounts to a whole day.

The next era that preſents itſelf, and the firſt that has pretenſions to be conſidered as hiſtorical, is that of *Bikramajit* (*n*). This prince, whoſe paternal kingdom was *Malwa,* and his capital *Ougein,* waged war againſt *Saka* king of *Dehli,* probably his lord paramount, and having overcome and ſlain him, aſcended in his ſtead the principal throne of India. Authorities differ widely as to the length of his reign (*o*); but he likewiſe is ſaid to have fallen in battle, fighting with a king who invaded him from the ſouthern provinces. He appears, from this account, in no other light than that of an unfortunate uſurper, yet his fame in the memory of the Hindoos has eclipſed that of his predeceſſors, his adventures are a favourite ſubject of romance, and an era has been diſtinguiſhed by his name. It is doubted, whether we ought to conſider his acceſſion, or his death, as conſtituting the proper epoch; but with regard to the time from which the reckoning dates there is no uncertainty, and the nature of the event is not eſſentially connected with our preſent object. It is placed in the year 56 before Chriſt, or in the 4657th of the Julian period, and correſponds with the 3045th year of the grand era (*p*).

I had occaſion to remark, when treating of the *Hejerà,* that this Mahometan era was computed, not from the day of the Prophet's flight, as generally ſuppoſed, but from the ordinary commencement of that year in which the flight happened (*q*); and thus we find, on comparing the Hindoo eras, that though ſome of them are profeſſed to be counted from the deaths of their kings or other hiſtorical events, they yet all begin from the ſame point of the ſun's annual courſe through the zodiac. The numerical reckoning of the years can well be conceived more liable to arbitrary change, as being leſs intereſting to the bulk of the people, than the obſervance of a particular day, whoſe periodical return is every where marked with popular ceremonies and ſuperſtitions.

The era to which *Salabân* has given name dates from the 78th year of Chriſt, or 4791ſt of the Julian period, commencing with the 3179th year of the grand era. As this is no leſs than 134 years later than that of *Bikramajit*, it ſeems a bold anachroniſm to make them cotemporaries, or to ſuppoſe, what is commonly aſſerted, that the one prince was the conqueror of the other (*r*). Fortunately for my preſent inveſtigation, it is hiſtory rather than chronology which ſuffers from this want of accuracy or diſcrimination in the annaliſts of India, or their Perſian tranſlators. *Salabân*, who is ſaid to have reigned many years over the ancient kingdom of *Narſinga*, in the northern part of the peninſula, is deſcribed as a liberal encourager of the ſciences. There is reaſon to think, that aſtronomy experienced a reformation and conſiderable improvements under his auſpices; and the profeſſors appear to have attached the celebrity of an era to his death, in reſpect for his talents and gratitude for his protection.

As the era of *Bikramajit* prevails chiefly in the higher or northern provinces of India, ſo does that of *Salabân* in the ſouthern, but more excluſively. In their current tranſactions, however, the inhabitants of the peninſula employ a mode of computation of a different nature, which, though not unknown in other parts of the world, is confined to theſe people amongſt the Hindoos. This is a cycle, or revolving period, of ſixty ſolar years, which has no further correſpondence with the eras above mentioned than that of their years reſpectively commencing on the ſame day. Thoſe that conſtitute the cycle, inſtead of being numerically counted, are diſtinguiſhed from each other by appropriate names, which, in their epiſtles, bills, and the like, are inſerted as dates, with the months, and perhaps the age of the moon annexed; but, in their writings of importance and record, the year of *Salabân* (often called the *Saka* year) is ſuper-added; and this is the more eſſential, as I do not find it cuſtomary to number the cycles by any progreſſive reckoning (*s*). In their aſtronomical calculations, we obſerve, that they ſometimes compute the year of their era by multiplying the number of cycles elapſed, and adding the complement of the cycle in which it commenced, as well as the years of the current cycle; but from hence we are led to no ſatiſfactory concluſion reſpecting the origin of this popular mode of eſtimating time (*t*). The preſumption is in favour of its being more ancient than their hiſtorical epochs. The preſent cycle, of which 43 complete years were expired in April 1790, began in the year 1747, with the year of *Salabân* 1669, and of the grand era 4848. M. LE GENTIL, to whom Europe is chiefly indebted for what is known of Hindoo aſtronomy, has fallen into an unaccountable error with regard to the years of this cycle, and their correſpondence with thoſe of the Kalee Yoog, as appears by the comparative table he has given of them, and other paſſages of his work. He ſeems to have taken it for granted, without due examination, that the year 3600 of the latter muſt have been produced by the multiplication of the cycle of ſixty into itſelf, and conſequently that the firſt year of this grand era muſt alſo have been the firſt of the cycle; but this is totally inconſiſtent with the fact; the Kalee Yoog began with the 13th year of the cycle of ſixty, and all the reaſoning founded on the ſelf-production and harmony of theſe periods muſt fall to the ground (*u*).

It now remains to take notice of a mode of reckoning peculiar to the province of *Bengal*, and thence denominated the *Bengal* era. The circumſtances of its inſtitution are involved in obſcurity, and I do not find that even a conjecture on the ſubject has yet been offered to the world. It is admitted, however, to have been impoſed by the Mahometan conquerors, and is therefore of no very remote antiquity. The moſt obvious conſideration that preſents itſelf, in examining the date of this era, is its proximity to the year of the Hejerà; the Bengal year 1196 complete ending on the 10th April, 1790, and the Hejerà year 1204 on the 10th September following. The difference has plainly ariſen from the inequality of the ſolar and lunar reckonings, and its accumulation ſince a certain period when they muſt of neceſſity have coincided; and it is no improbable ſuppoſition, that the time of ſuch coincidence was alſo that of introducing the mode of computation which has ſince prevailed. By aſcertaining the amount of this difference, and the number of years required to produce it, we may expect to arrive at a knowledge of the period in queſtion, or to approximate it at leaſt. As the Hindoos compute from the elapſed year, and the Mahometans by the current, the difference between the two dates ſhould be ſix years and ſeven months; but as this correction of one year may be preſumed equally applicable at the ſuppoſed time of the coincidence, and therefore unneceſſary in this inſtance, it will follow that the real difference ſhould be found by a ſimple ſubtraction of one date from the other, and conſequently be ſeven years and ſeven months. The annual exceſs of the Hindoo or ſydereal year above the Mahometan or lunar being 10 d. 21½ h., an interval of 254 years is required to produce this difference, or 220 years, to produce that of ſix years and ſeven months. The former number being deducted from 1790, carries us back to the year 1536, in the reign of the Mogul emperor *Humaioon*, and the latter to 1570, in that of *Akbar*. About one or other of theſe periods we ſhould ſeek for ſome record of the inſtitution, but the hiſtories we poſſeſs throw no light upon the ſubject. Several gentlemen, converſant in the affairs of Bengal, to whom I have referred it, confirm the general idea as above given, but diſagree as to the political circumſtances. By one, the regulation is aſcribed to *Sheer Shah*, who wreſted the empire from *Humaioon*, and governed it for ſome years with wiſdom and energy, when his death, and the diſtractions that enſued, reſtored it to the former poſſeſſor; and, by another authority, to *Akbar*, deſervedly named the Great, who was next in ſucceſſion.

The moſt obvious way of accounting for the peculiar mixture of Hindoo and Mahometan obſervances in this reckoning, appears to be, that the zeal of the monarch for eſtabliſhing the era of his prophet had effected only a partial or temporary innovation; and that his new ſubjects, who were conſtrained to adopt as an epoch that year of the Hejerà in which the royal edict bore date, could not ultimately be forced to change their accuſtomed ſolar year for one that rapidly inverted the order of the ſeaſons. But this attempt muſt be referred to a period ſomewhat earlier than the reigns of theſe particular princes, which were diſtinguiſhed by a liberal policy; and the gentlemen above alluded to attribute to them reſpectively, not the interdiction but the *reſtitution* of the ſolar reckoning; that of the Mahometans, impoſed on the province by their more bigotted predeceſſors, being found inconſiſtent with the periodical collection of the revenue, which depends on the harveſts (*v*). It is, in truth, extremely difficult to conceive, how a mode of computation, ſo much at variance with the rational concerns of civilized people, can poſſibly ſubſiſt in any ſtate of ſociety above that of the paſtoral and predatory tribes with whom it originated.

As it appears, that the people of *Siam*, in the farther India, have borrowed their knowledge of aſtronomy from the Hindoos, it will not be thought inconſiſtent with the ſubject I am treating, to add ſome account of the chronological eras in uſe amongſt them. Of theſe, one has been termed their civil, and another their aſtronomical era. The civil reckoning is by lunar years, conſiſting ordinarily of 12 months each, with an intercalation of 7 months in the period of 19 years, and commencing with the new moon that precedes the winter ſolſtice. This era is computed from the ſuppoſed time of the introduction of their religion by *Sommona-codom*, 544 years before Chriſt, or in the year of the Julian period 4169; and conſequently 2333 years of it were expired in the month of December, 1789; but by a cuſtom which, though not without its parallel, wants to be ſatisfactorily explained, they do not change the date, or count the ſucceeding year 2334, till it meets the aſtronomical reckoning in the month of April following.

The aſtronomical era is founded immediately upon the tables and modes of calculation adopted from the Hindoos. The French aſtronomer, DOM. CASSINI, by an ingenious deduction from no very circumſtantial *data*, inferred that it muſt have had for its epoch a mean conjunction of the ſun and moon, which happened on 21ſt March, 638 of the Chriſtian era. This preceded by a few hours the commencement of the eſtabliſhed Hindoo year, to which it was evidently meant to be accommodated, though it is by him referred to the vernal equinox, which took place two days earlier (*w*). The length of the Siameſe ſolar year he found to be 365 d. 6 h. 12′ 36″ (*x*), and conſequently 1152 years of the era ſhould expire on the 11th April, 1790, when the ſun enters the Indian zodiac, being 560 years later than the era of *Salabán*. For want of corroborating facts, this determination of an epoch by M. CASSINI was conſidered as ſpeculative and uncertain; but I am accidentally in poſſeſſion of a date, which, though not preciſe, may ſerve generally to authenticate it. "In 1769, the king of *Pegu* (a country bordering on *Siam*, and formerly conquered by it) dates his letter to the French at Pondicherry, the 12th of the month *Kchong* 1132." This makes 1790 to correſpond with 1153 inſtead of 1152; but when we conſider the vague manner in which notices of this kind are given, a difference of one year can ſcarcely be urged as an objection.

The Siameſe were alſo accuſtomed to make uſe of a cycle of ſixty years, expreſſed by a repetition of twelve names of certain animals, which, I obſerve, are for the moſt part the ſame with thoſe employed, for the ſame purpoſe, by the Chineſe and Mogul Tartars, from whom we may conclude it has been borrowed (*y*); but the meager and unſatisfactory examples of its application, furniſhed by M. LOUBERE and P. TACHARD, do not afford us the means of determining at what time they began to reckon their cycle. It appears only that the year 1687 was the tenth of the leſſer or conſtituent cycle of twelve years (z).

In the foregoing account of the Indian eras, I am ſenſible that I have omitted many circumſtances, the detail of which, if accurately given, might be uſeful and intereſting; but at this diſtance from the countries where thoſe eras are employed, the means of information are limited, and particularly with reſpect to the variations prevailing in the different provinces of what was formerly the Mogul empire. Unfurniſhed myſelf with local knowledge, my objects have been to compare and reconcile the information already given to the world with the experience of perſons who have reſided in Hindoſtan, and to correct and ſubſtantiate the whole by bringing it to the teſt of modern accuracy in the ſcience of aſtronomy. In fulfilling the laſt eſpecially I confeſs myſelf under obligations for eſſential aſſiſtance.

NOTES.

(*a*) See the French tranſlation of the *Bhagavat*, under the title of *Bagavadam ou Doctrine divine*, p. 187. et ſeq. Compare alſo the liſts of ancient kings of *Dehli*, in Bernoulli, Deſcription de l'Inde, Vol. I. p. 153. (from P. Tieffenthaler), and Vol. II. p. xxxix. (by M. Anq. du Perron); in the former of which a celebrated *Rajah* is made to reign 90 years, and in the latter no more than 3 years.

(*b*) M. le Gentil, Voyage dans les Mers de l'Inde, Vol. I. p. 231. According to the Hindoo Treatiſe of Aſtronomy, called the *Soorya Seedhanta* (of which I have ſeen ſome tranſlated extracts), the length of the ſydereal year is 365 d. 6 h. $12' 36'' 33''' 36''''$, or about $6''\frac{1}{2}$ longer than that given by M. le Gentil.

(*c*) Phil. Tranſ. Vol. LXVII. p. 598. ſee an account, by Sir Robert Barker, of the Obſervatory at *Benares*; and in Bernoulli, Vol. I. p. 316. and 347. (from Tieffenthaler) of thoſe at *Jēpour* and *Ougein*, conſtructed by *Rajah Jēſing*, in the preſent century.

(*d*) The Hindoo names of the ſolar ſigns, and of the months with which they correſpond, as alſo of the lunar conſtellations or manſions, are as follows:

Solar Signs.	Months.	
1 *Mēſh*	*Bīſāk* or *Vīſāk* *	April
2 *Breeſh* or *Vreeſh*	*Jeat* or *Jēſht*	May
3 *Meetoon*	*Aſār*	June
4 *Karkat*	*Sāwan* or *Srāvan*	July
5 *Seengh*	*Bhādoon*	Auguſt
6 *Kanyā*	*Āſan*	September
7 *Toolā*	*Kārteek*	October
8 *Vreeſcheek*	*Āghan* or *Agrahan*	November
9 *Dhanoo*	*Pooſh* or *Powſh*	December
10 *Makar*	*Māg*	January
11 *Koombha*	*Phāgan* or *Phalgoon*	February
12 *Meen*	*Chīt* or *Chītr*	March

According to the foregoing liſt, the Hindoo year begins with *Bīſāk* (anſwering to April from about the 10th of that month); and for this arrangement I have the authority of three almanacs, publiſhed at Calcutta, for different years, and by different perſons, as well as that of Mr. Halhed's tranſlation of a Code of Gentoo Laws, p. 24.; yet I obſerve that M. le Gentil, Abraham Roger, Beschius, Waltherus, and all the miſſionaries, agree in placing the month

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* The former is the common *Hindooſtanee*, the latter the *Sanſkreet* orthography: for both I am indebted to Mr. Wilkins.

Chit, or *Chitr*, at the head of the year (inſtead of the concluſion), and making it to correſpond with April. I can no way reconcile this incongruity, and only remark, that all the authorities for the one practice are from Bengal, and all thoſe for the other from the peninſula of India.

Lunar Conſtellations.

1 *Aſwenee*
2 *Bharanee*
3 *Kreetteekā*
4 *Roheenee*
5 *Mreegaſeera*
6 *Adree*
7 *Poonarvaſoo*
8 *Pooſhwa*
9 *Aſlēſhā*
10 *Magha*
11 *Poorva-phālgoonee*
12 *Oottara-phālgoonee*
13 *Haſta*
14 *Cheetrā*
15 *Swātee*
16 *Veeſakhā*
17 *Anooradhā*
18 *Jyēſhta*
19 *Moolā*
20 *Poorvāſhārā*
21 *Oottarāſhārā*
22 *Abheejeet*
23 *Sravana*
24 *Dhaneeſhthā*
25 *Satabheepā*
26 *Poorva-bhādrapad*
27 *Oottara-bhādrapad*
28 *Rēvatee*

The number of the lunar conſtellations is more uſually ſtated as amounting to twenty-ſeven only; and that which in the above liſt appears as the twenty-ſecond, is ſaid (in the *Ayeen Akbery*) to have been formed out of thoſe contiguous, for ſome particular purpoſe. As the moon's periodical revolution is performed in 27 days and part of the 28th, it is not ſurpriſing that this ambiguity with reſpect to the divſion of the zodiac ſhould exiſt.

(*e*) Thus they ſay, "on the *full moon* in the (ſolar) month *Bhādoon*;" "on the moon's increaſe in the month *Sāwan*;" "on the firſt day of the *bright half* of the month *Bīſāk*." It is to be obſerved, that they term the ſemi-lunation from the change to the full, the *bright* half of the moon, becauſe it is above the horizon during thoſe hours wherein it is likely to be viſible. From the full to the change is called the *obſcure* half; becauſe, during the latter part, it does not riſe till the hours of reſt. See BESCHIUS, Gram. Lat. Tam. p. 167. and Mr. WILKINS, Heetōpadēs, Note 70. to p. 43.

(*f*) Theſe lunar years do not appear to be ever taken collectively, or regarded in computations of time; and the months of which they conſiſt may not improperly be conſidered as a lunar diviſion of the ſolar year.

(*g*) P. DU CHAMP (BAILLY, Traité de l'Aſtronomie Indienne, p. 320.).

(*h*) This arrangement of the names of the days, ſo different from the order of the planets, is ingeniouſly accounted for by COSTARD, in his Hiſtory of Aſtronomy, p. 156. from the aſtrological appropriation of a planet to each of the 24 hours; but the reaſoning applies rather more directly to the Indian diviſion of the day into ſixty parts or hours. If we ſuppoſe, for example, that the ſun is made to preſide over the firſt hour of Sunday, Mars over the ſecond, Jupiter over the third, &c. in their natural order, we ſhall find the moon to anſwer to the firſt hour of Monday, Mars to the firſt of Tueſday, and ſo of the reſt. To make the rule apply to the European diviſion, we muſt reverſe the order, and reckon downwards from the ſun to Venus, Mercury, and the moon. The Hindoo names for the days of the week are properly as follows, though from the variety of appellations given to the planets, and particularly to the ſun and moon, they are ſometimes differently called.

Ādeetya- *Ravee-* *Soorya-*	*-vara*	Sunday	Solis dies
Chandra- *Sōma-*	*-vara*	Monday	Lunæ
Mangala-	*vara*	Tueſday	Martis
Booddha-	*vara*	Wedneſday	Mercurii
Vreehaſpatee-	*vara*	Thurſday	Jovis
Sookra	*vara*	Friday	Veneris
Sannee-	*vara*	Saturday	Saturni

(*i*) At ſunriſe, according to M. LE GENTIL and others; but according to the *Soorya-Seedhanta* (before quoted), it is ſaid to have begun immediately after midnight. This treatiſe eſtimates alſo the diurnal revolutions from midnight, if we may credit the *Ayeen Akbery*, Vol. III. p. 14.

(*k*) "Les Indiens diſent qu'à l'inſtant du *Caliougam* il y a eu une conjonction generale de toutes les planètes; leurs tables en effet indiquent cette conjonction, et les nôtres montrent qu'elle a pu réellement avoir lieu." Traité de l'Aſtron. Ind. p. xxviii. "Le témoignage des Brames eſt ici appuyé ſur nos tables; et ce témoignage, qui n'a pu être fondé ſur un calcul, doit être dû à une obſervation réelle," p. 184.

(*l*) They frequently extract the ſquare root, apply the propoſition which is the 47th of EUCLID, and appear to have no mean knowledge of ſpherical trigonometry.

(*m*) The commencement of the *Kalee-Yoog* being calculated by the Hindoos according to the ſun's *mean* place, and the ordinary commencement of their years, according to his *true* place, it becomes neceſſary, when they compute the time elapſed from the beginning of their era, until that of any given year, to allow for the difference between the mean and true places at the former period, and on this account they deduct 2 d. 3 h. 32′ 30″ from the whole number of days.

(*n*) This is the common mode of ſpelling the name after the Perſian; according to the Sanſkreet orthography, it ſhould be *Veekramadeetya.* The place of his birth is ſaid to be *Toumma-naggree*, in the north-eaſtern part of *Malwa.* Prior to the era of *Bikramajit*, the Hindoos appear to have reckoned by that of *Judiſhter* (or *Yoodhe-ſhteerá*), a king ſuppoſed to have reigned at *Haſtinapoor* about the commencement of the *Kalee-Yoog.* Of this era 3044 years are ſaid to have expired when the new reckoning was adopted; but the date is no other than that of the *Kalee-Yoog* itſelf, with the 3045th of which, as is ſeen by the table, the era of *Bikramajit* commenced. The tranſlation of the *Benares Pattra* makes the year of *Judiſhter*, 3044, to correſpond with the year 1784 of the Chriſtian era.

(*o*) See (*a*), latter part.

(*p*) The copper plate diſcovered at *Mongueer*, and tranſlated by Mr. Wilkins (Aſiatic Reſearches, Vol. I. p. 123), is dated in the 33d year of an era ſuppoſed to be that of *Bikramajit*, who is alluded to in the inſcription by an epithet ſignifying the *foe of Sakă.* For other ancient dates of this era, ſee Aſiatic Reſearches, p. 287. and 380. M. Bailly (Traité de l'Aſtr. Ind. p. cxxx.), quoting the authority of M. Anq. du Perron, places it 54 inſtead of 56 years before Chriſt.

(*q*) Phil. Tranſ. Vol. LXXVIII. p. 416.

(*r*) Take the two following paſſages as inſtances. "*Bikermajit* ruled for ſome time over the northern parts of the *Deccan*; but the *Rajahs*, headed by *Salbahan*, having revolted, they gave him battle, and he was ſlain." F. Wilford, Aſiat. Reſ. p. 374. "Bikarmadjit tint ſa cour à *Oudjen*; c'eſt à lui que commence l'ere Indienne. Il fut vaincu et tué dans une battaille par *Salbhân* roi *Patane.*" Bernoulli (P. Tieffenthaler), Vol. I. p. 357. The confuſion ariſing from this anachroniſm is increaſed by an ambiguity of names; for that of *Sakă* or *Sak*, which belonged to the predeceſſor of Bikramajit, is likewiſe a name by which *Salabân* is commonly known, and from which his era is called the *Sak-âbda.*

For the relative date of the era of Bikramajit, I have the authority of Mr. Wilkins (Aſiat. Reſ. Vol. I. p. 130.), who makes 1837 correſpond with 4882 of the *Kalee-Yoog*, and with 1703 of Salabân. Theſe are corroborated in a manner that puts their accuracy out of diſpute.

(*s*) The manner of dating appears thus in a grant of land, of which a tranſlation is given in the Aſiatic Reſearches, Vol. I. p. 363. "On the fifteenth of the bright moon of *Cartica*, in the middle of the year *Pingala*, when nine hundred and forty years, ſave one, are reckoned as paſt from the time of king *Sáca*, or in figures, the year 939, the moon being then full and eclipſed."

The names by which the years of the cycle are diſtinguiſhed, and of which the ſignifications relate to the ſun, as having a good or evil influence, or to the year, as being more or leſs lucky, are as follows:

1	Prabhava
2	Veebhava
3	Sookla
4	Parama-jyōtee
5	Projōtpatee
6	Anggeeraſa
7	Sree-mookha
8	Bhava
9	Yoova
10	Dhātoo
11	Eeſwara
12	Bahoodhānya
13	Pramadee
14	Veekrama
15	Veeſhoo
16	Cheetrabhānoo
17	Soobhānoo
18	Tarana
19	Pārtheeva
20	Vyaya
21	Sarvajeet
22	Sarvadharee
23	Veerooddhee
24	Veekreetee
25	Kara
26	Nandana
27	Veeſhya
28	Jaya
29	Manmatha
30	Doormookha
31	Aveelambee
32	Veelambee
33	Veekāree
34	Servaree
35	Plava
36	Soobha-kreet
37	Sōbhā-kreet
38	Krōdhee
39	Veeſwavaſoo
40	Parābhava
41	Plavanga
42	Keelaka
43	Sowmya
44	Sādhārana
45	Veerōdhakreet
46	Pareetāpee
47	Pramadeechā
48	Ānanda
49	Rakſhaſa
50	Nala
51	Peengala
52	Kala-yooktee
53	Sceddhārthee
54	Rowdree
55	Doormatee
56	Doondoobhee
57	Roodrādheekāree
58	Raktākſhee
59	Krodhana
60	Akſhaya

(*t*) At the commencement of the era of *Salabân*, 49 years were wanting to complete the current cycle; and, in calculations where it is neceſſary to adjuſt the two reckonings, this number muſt be attended to; but as the object to be known is not the number of cycles, but the number of the year of an individual cycle, or the correſponding year of the era, it is indifferent whether in their additions and ſubtractions they make uſe of 49 years ſimply, or of 49 added to one or more integral cycles, as 109, 349, or 409, which produce the ſame reſult. This accounts for the difference of practice remarked by M. BAILLY (p. 51.) in the Brahmans of different cities, and it ſeems to have no relation to the origin of the cycle.

(*u*) M. LE GENTIL, Voyage dans les Mers de l'Inde, Vol. I. p. 240—5. In the common notes of an almanac, publiſhed at *Calcutta*, by Mr. REUBEN BUR-

ROW, the year 1784 is made to correſpond with the years 48 and 49 (or *Anund* and *Rakſheſa)* of the cycle of ſixty, which appears to have the ſanction of a Preface to the Benares *Pattra*, or calendar, of which a tranſlation is given. Though reluctant to call ſuch authority in queſtion, I venture to aſſert, that the true Hindoo date ſhould be 37 and 38, for the former and latter part of 1784. From among a variety of authorities concurring to eſtabliſh this computation, I ſhall produce, in the firſt place, that of Beſchius, the Author of a Grammar of the *Tamool* language (peculiar to that country in which the cycle is uſed), who has treated briefly, but with great accuracy, of chronology, and given the names of the 60 years in the original character, with the correſponding dates. M. LE GENTIL mentions having poſſeſſed himſelf of a copy of this work (printed at Tranquebar in 1738), and bringing it with him to Europe. ABRAHAM ROGER (whoſe book, entituled, in the French tranſlation from the Dutch, *De la Vie et des Mœurs des Brames*, and printed at Amſterdam in 1670, contains much original information reſpecting the Hindoos) gives likewiſe the names of the ſixty years; and ſays (p. 79.), that the year 1640, in the month of Auguſt, correſponded with *Wicrama*, the 14th of the cycle; conſequently 1760 with the 14th alſo, and 1784 with the 38th. The communications of WALTHERUS, a learned miſſionary, publiſhed by BAYER under the title of *Doctrina temporum Indica*, are explicit as to this point. M. BAILLY, in his *Traité de l'Aſtronomie Indienne*, adopts in his calculations the date that I have aſſigned, and gives (p. 326.) the years of the cycle of ſixty from P. DU CHAMP, in which 1724 (and conſequently 1784) is remarked as correſponding with the 38th year. To this, if it were neceſſary, I might add the authority of a *Hindoo date* in the Aſiatic Reſearches, before quoted, where the year *Pingala* (51) agrees with 939 of *Saca* or *Salabân*. The year 1 of the preſent cycle correſponded with 1669 of the era, according to the table I have given; and therefore 51 of the preceding cycle with 1659, from which deduct twelve whole cycles, or 720 years, and 939 remain; which, as the table was founded on other documents, will be allowed no weak corroboration, the date in queſtion being from an ancient copper plate. I obſerve, with ſome concern, that I differ alſo from Mr. BURROW, both in the year of *Bikramajit* and that of *Salabân*. He makes the interval between them 136 years, whereas, by the authorities I have followed, it ſhould be only 134, or 56 years before Chriſt, and 78 after. I ſhould certainly not be forward to point out theſe apparent inaccuracies but from an apprehenſion, were I to paſs them unnoticed, that my own computations might be condemned on an appeal to thoſe of Mr. BURROW's almanac as a criterion. I have not ſeen any ſubſequent to that for 1784, which was the firſt.

(*v*) On reference to the *Ayeen Akbery*, or Inſtitutes of the emperor *Akbar*, I find mention made (Vol. I. p. 344.) of an era eſtabliſhed by him, being that of the commencement of his reign, in the year of Chriſt 1556. Although nothing is ſaid of the conformity of its date with the current year of the *Hejera*, yet it is probable that this was the origin of what has ſince been called the Bengal era.

In the province of *Behar*, and ſome other parts of the empire, a year was eſtabliſhed with a view to the revenue ſolely, called the *Fuſſulee* year. It appears to begin, and to take its date, from the month of September preceding the commencement of the common Bengal year, and therefore 1198 ſhould begin in September 1790. Mention is made (in the Alph. Grandonico-Malabaricum, Romæ, 1772) of an era employed in the ſouthern extremity of the peninſula, of which 965 ſhould correſpond with the year of Chriſt 1790.

(*w*) Mem. Acad. des Sciences, Tom. VIII. p. 218. Traité de l'Aſtronomie Ind. p. 18. and 21.

(*x*) This agrees with the Hindoo year given in the *Soorya Seedhanta*, and differs 6″ from that by M. LE GENTIL. Theſe ſmall differences ariſe probably from the forms of calculation, and are not fundamental.

(*y*) The cycle of the Chineſe and Tartars comprehends 60 years, expreſſed by an artificial arrangement of 10 words or particles, prefixed to the names of 12 animals, in ſuch a manner that 6 repetitions of the former coincide with 5 repetitions of the latter, and bring them to the ſame relative ſituation at the recommencement of the cycle.

(*z*) LOUBERE, Relation of Siam, Eng. tranſ. 1693, p. 169. et 202. Journal du Voyage de Siam, par M. L. D. C., Par. 1687, p. 286. Hiſtoire Nat. et Pol. du Royaume de Siam, par N. Gervaiſe, Par. 1688, p. 154, 155.